SUM-8452

DRAFT
FIELD SAMPLING PLAN FOR GROUND WATER

OF THE
CAMP EDWARDS IMPACT AREA GROUNDWATER QUALITY STUDY

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS

Prepared for

NATIONAL GUARD BUREAU
ARLINGTON, VIRGINIA

Prepared by

OGDEN ENVIRONMENTAL AND ENERGY SERVICES
239 Littleton Road, Suite 1B
Westford, Massachusetts 01886

September 18, 1997

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DISCLAIMER:

This document has been prepared pursuant to a government administrative order (U.S. EPA Region I SDWA Docket No. I-97-1019) and is subject to approval by the U.S. Environmental Protection Agency. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency.

A.15 Ground Water Field Sampling Plan

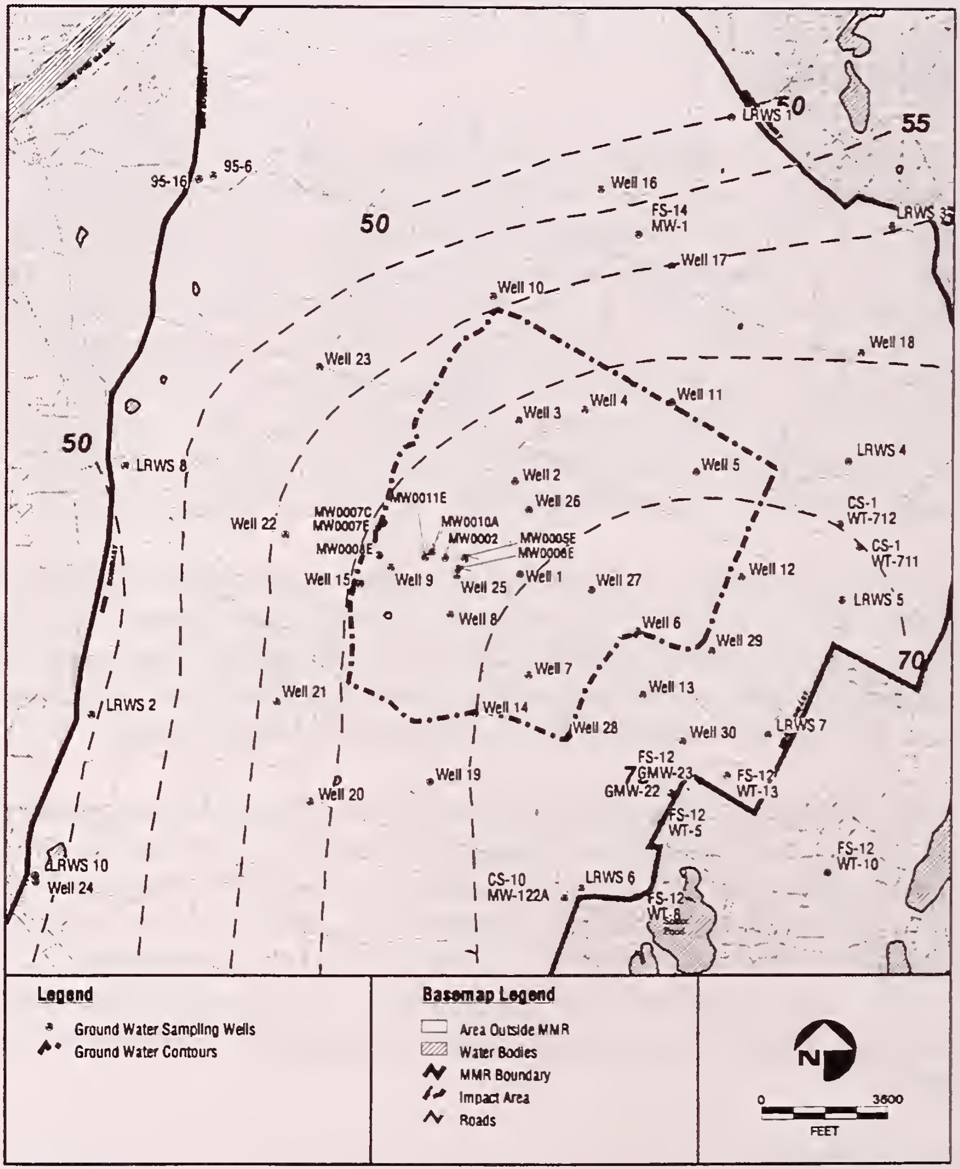
A.15.1 Introduction

Fifty-two investigation monitoring wells will be installed as part of the Camp Edwards Impact Area Groundwater Quality Study. Upon completion of investigation well installation the wells will be developed per MMR Standard Operating Procedures. Using the low flow method, ground water samples will be collected for analysis. Ground water data will be collected from all newly installed wells, the nine LRWSPAT test wells (one of the ten is dry), the two Bourne Wells (95-6 and 95-16), and 18 IRP monitoring wells including: eight from CS-19 (MW0002, MW0005E, MW0006E, MW0007E, MW0007C, MW0008E, MW0010A, and MW0011E); six from FS-12 (WT-5, WT-8, WT-10, WT-13, GMW-22, and GMW-23); two from CS-1 (WT-711, and WT-712); and one from FS-14 (MW-1) and one from CS-10 (MW122A) (see Figure A.15-1).

Ogden will coordinate with the IRP and Jacobs Engineering to evaluate the ground-water analytical data for each of the existing wells and will determine whether data collected within the last year meets the data quality objectives of this ground water quality study. Where appropriate, Ogden will utilize previous ground-water data and supplement existing data with that obtained from this the ground-water sampling effort.

Ground water will also be collected from existing wells to assess the background water quality conditions for the impact area. Background data will be collected for the following wells: the LRWSPAT wells (mentioned above), 90MW0054 (FS-12), 03MW0604 AND 03MW0060 (CS-10), 28MW0106, USFW228040, USFW241098, BB-703, USGS BHW215983, USGS SD263111, USGS SD26160 and SANDWICH WT-07 (Figure A.15-2). The Background Field Sampling Plan for the Camp Edwards Impact Area Groundwater Quality Study contains additional information regarding the sampling of these wells.

Ground-water sampling will be conducted consistent with MMR SOPs, the Action Plan for the Camp Edwards Impact Area Ground Water Quality Study, the July 30, 1996 USEPA Region 1 Low Stress (Low Flow) Purge and Sampling Procedure for the Collection of Ground Water Samples From Monitoring Wells (SOP# GW0001), and the Ogden Health and Safety Guidelines.



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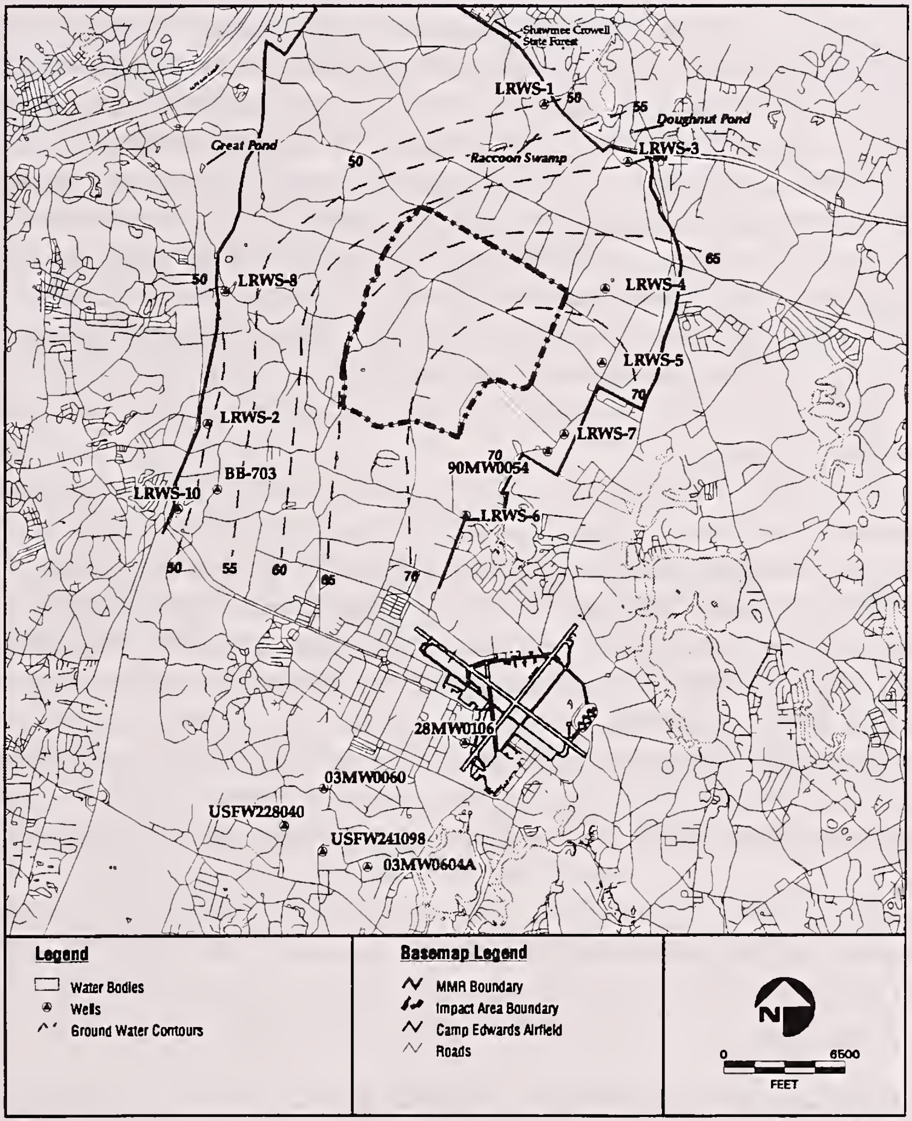
MMR - Monitoring Wells

FIGURE
A.15-1



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Background Well Locations

FIGURE A.15-2

A.21.2 Sampling and Analysis

A submersible pump or bladder pump will be used to purge water from the monitoring well. Dedicated polyethylene tubing will be attached to the pump and used for purge water discharge. After the pump is started, flow will be adjusted to prevent the water level in the well from being drawn down more than 0.3 feet. Water level readings and pump flow rates will be recorded every 3 to 5 minutes. Purge water will be continuously monitored for water quality parameters including pH, specific conductance, turbidity, dissolved oxygen, temperature, and redox (Eh). A groundwater sample will be collected after the parameters stabilize or after a maximum of four hours of purging. If these parameters do not stabilize in four hours a ground water sample will be collected at that time. Samples for VOC analysis will be collected first.

Preliminary Site Activities

- Decontaminate water level indicator and sampling equipment.
- Check well for damage or evidence of tampering and record observations.
- Lay out sheet of clean polyethylene for monitoring and sampling equipment.
- Remove well cap and immediately measure VOCs at the rim of the well with a Photo Ionization detector (PID) or Flame Ionization Detector (FID) instrument and record the reading in the field logbook.
- If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), make one and describe the mark in the logbook.
- Prior to purging and sampling the water level measurement (to 0.01 ft) will be recorded.
- The total well depth (to 0.1 ft) will be taken from the Well Construction Diagram (measurement will be confirmed after well sampling).

Purging and Sampling

1.) Measure the water level before installing the pump.

2.) Install pump slowly to the midpoint of the screened interval. Keep the pump intake at least two feet above the bottom of the well to minimize mobilization of particulates at the well bottom.

3.) Measure water level before starting the pump.

4.) Purge well using low stress sampling technique as follows:

- Start the pump at the lowest speed setting. If necessary, slowly increase the speed until discharge occurs.
- Check the water level and adjust the pump speed until there is little or no water level drawdown (less than 0.3 feet).
- If the minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging until indicator parameters stabilize.
- Monitor and record the water level and pumping rate every 3 to 5 minutes (or as appropriate) during purging.
- Record any pumping rate adjustments (both time and flow rate.)
- Pumping rates should be reduced as needed to ensure stabilization of indicator parameters.
- Adjustments should be made within the first 15 minutes of pumping in order to help minimize purging time.
- During pump start-up drawdown may exceed the 0.3 feet target and then recover as pump flow adjustments are made. Purge volume calculations should utilize the stabilized drawdown value not initial drawdown.
- Do not allow the water level to fall to the intake level (if the static water level is above the well screen, avoid lowering the water level into the screen.)
- The final purge volume must be greater than the stabilized drawdown volume plus extraction tubing volume.
- If the well runs dry the well will be sampled as soon as enough water recharges to enable sampling regardless of parameter stabilization.

5.) Monitor Indicator Field Parameters (Turbidity, Temperature, Specific Conductance, pH, Eh, and DO) using a clear flow-through-cell for all parameters (flow-through-cell is not required for turbidity measurements) as follows:

- During well purging monitor indicator field parameters every three to five minutes, as appropriate, until stabilization occurs.
- Stabilization has been achieved when three consecutive readings taken at 3 to 5 minute intervals are within the following ranges:

Parameter	Stabilization Range
Turbidity	10% for values greater than 1 NTU
Dissolved Oxygen (DO)	10%
Specific Conductance	3%
Temperature	3%
pH	+ or – 0.1 unit
Oxidation Reduction Potential (ORP/Eh)	+ or – 10 millivolts

- If particulate build-up occurs such that the cell requires cleaning, continue pumping and disconnect the cell for cleaning.
- The flow-through-cell must be designed to prevent air bubble entrapment in the cell. When the pump is turned off or when using a bladder pump that is cycling on/off the water in the cell must not drain out. Probes must be submerged at all times.
- If more than one flow-through-cell is used in series the dissolved oxygen probe should come first because this parameter is most susceptible to error associated with air leaks in the system.

6.) Collect Water Samples

- Water samples must be collected before passing through the flow-through-cell.
- During purging and sampling, the tubing should remain filled with water so as to minimize possible changes in water chemistry upon contact with the atmosphere. If the pump tubing is not completely filled to the sampling point, collect non-VOC samples first, then increase the flow rate until the water fills the tubing. Then collect the VOC sample and record the new drawdown, flow rate, and parameters.
- Sample containers will be pre-filled by the laboratory with the appropriate amount of preservative.
- For filtered metals concentrations an in-line filter is required. Pre-rinse the 0.45 ɥm size filter with approximately 25-50 ml of ground water prior to sample collection.
- Samples will be labeled as they are collected.
- Samples will be immediately placed into a cooler with ice.
- Measure and record dissolved oxygen content using field test kit.
- Measure total well depth after completion of sampling.
- Secure the well prior to departing.

Table A.15-1 Samples to be collected from Monitoring Wells

MMR Groundwater Samples from Newly Installed Wells				Parameters:	Explosives(colorimetric)	Explosives (EPA 8330)	Inorganics:	Metals (unfiltered)	Metals (filtered)	Cyanide	Phos., NO2/NO3, NH4	Cl & SO4	Alkalinity (carbonate, bicarbonate, & hydroxy)	TOC	Other Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
				Cont:	250ml	2*1L		500mL	500mL	1L	1L	1L	100mL	2*40mL		3*40mL	2*1Lg	2*1Lg	2*1Lg	3*40mL	3*40mL
Loc.	Depth	MMR ID	EPA/ Ogden ID	Pres:		none		HNO3	HNO3	NaOH	H2SO4	none	none	H2SO4		HCl	none	none	none	thioS	HCl
MW1	D	71MW01DXDX01XA	W01DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW01DXDX01XL	W01DDL						X												
	M	71MW01MXMX01XA	W01MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW01MXMX01XL	W01MML						X												
	S	71MW01SXSX01XA	W01SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW01SXSX01XL	W01SSL						X												
MW2	D	71MW02DXDX01XA	W02DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW02DXDX01XL	W02DDL						X												
	M	71MW02MXMX01XA	W02MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW02MXMX01XL	W02MML						X												
	S	71MW02SXSX01XA	W02SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW02SXSX01XL	W02SSL						X												
MW3	D	71MW03DXDX01XA	W03DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW03DXDX01XL	W03DDL						X												
	M	71MW03MXMX01XA	W03MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW03MXMX01XL	W03MML						X												
	S	71MW03SXSX01XA	W03SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW03SXSX01XL	W03SSL						X												

X = to be collected and submitted to laboratory

Draft FSP Ground Water

MMR Groundwater Samples from Newly Installed Wells				Parameters:	Explosives(colorimetric)	Explosives (EPA 8330)	Inorganics:	Metals (unfiltered)	Metals (filtered)	Cyanide	Phos., NO2/NO3, NH4	Cl & SO4	Alkalinity (carbonate, bicarbonate, & hydroxy)	TOC	Other Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
				Cont:	250ml	2*1L		500mL	500mL	1L	1L	1L	100mL	2*40mL		3*40mL	2*1Lg	2*1Lg	2*1Lg	3*40mL	3*40mL
Loc.	**Depth**	**MMR ID**	**EPA/ Ogden ID**	Pres:		none		HNO3	HNO3	NaOH	H2SO4	none	none	H2SO4		HCl	none	none	none	thioS	HCl
MW4	S	71MW03SXSX01XA	W03SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW03SXSX01XL	W03SSL						X												
MW5	D	71MW05DXDX01XA	W05DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW05DXDX01XL	W05DDL						X												
	M	71MW05MXMX01XA	W05MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW05MXMX01XL	W05MML						X												
	S	71MW05SXSX01XA	W05SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW05SXSX01XL	W05SSL						X												
MW6	S	71MW06SXSX01XA	W06SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW06SXSX01XL	W06SSL						X												
MW7	D	71MW07DXDX01XA	W07DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW07DXDX01XL	W07DDL						X												
	M	71MW07MXMX01XA	W07MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW07MXMX01XL	W07MML						X												
	S	71MW07SXSX01XA	W07SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW07SXSX01XL	W07SSL						X												
MW8	S	71MW08SXSX01XA	W08SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW08SXSX01XL	W08SSL						X												

X = to be collected and submitted to laboratory

MMR Groundwater Samples from Newly Installed Wells				Parameters:	Explosives(colorimetric)	Explosives (EPA 8330)	Inorganics:	Metals (unfiltered)	Metals (filtered)	Cyanide	Phos., NO2/NO3, NH4	Cl & SO4	Alkalinity (carbonate, bicarbonate, & hydroxy)	TOC	Other Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
				Cont:	250ml	2*1L		500mL	500mL	1L	1L	1L	100mL	2*40mL		3*40mL	2*1Lg	2*1Lg	2*1Lg	3*40mL	3*40mL
Loc.	Depth	MMR ID	EPA/ Ogden ID	Pres:		none		HNO3	HNO3	NaOH	H2SO4	none	none	H2SO4		HCl	none	none	none	thioS	HCl
MW9	S	71MW09SXSX01XA	W09SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW09SXSX01XL	W09SSL						X												
MW10	D	71MW10DXDX01XA	W10DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW10DXDX01XL	W10DDL						X												
	M	71MW10MXMX01XA	W10MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW10MXMX01XL	W10MML						X												
	S	71MW10SXSX01XA	W10SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW10SXSX01XL	W10SSL						X												
MW11	S	71MW11SXSX01XA	W11SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW11SXSX01XL	W11SSL						X												
MW12	S	71MW12SXSX01XA	W12SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW12SXSX01XL	W12SSL						X												
MW13	D	71MW13DXDX01XA	W13DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW13DXDX01XL	W13DDL						X												
	S	71MW13SXSX01XA	W13SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW13SXSX01XL	W13SSL						X												
MW14	S	71MW14SXSX01XA	W14SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW14SXSX01XL	W14SSL						X												

X = to be collected and submitted to laboratory

Draft FSP Ground Water

MMR Groundwater Samples from Newly Installed Wells				Parameters:	Explosives(colorimetric)	Explosives (EPA 8330)	Inorganics:	Metals (unfiltered)	Metals (filtered)	Cyanide	Phos., NO2/NO3, NH4	Cl & SO4	Alkalinity (carbonate, bicarbonate, & hydroxy)	TOC	Other Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
				Cont:	250ml	2*1L		500mL	500mL	1L	1L	1L	100mL	2*40mL		3*40mL	2*1Lg	2*1Lg	2*1Lg	3*40mL	3*40mL
Loc.	Depth	MMR ID	EPA/ Ogden ID	Pres:		none		HNO3	HNO3	NaOH	H2SO4	none	none	H2SO4		HCl	none	none	none	thioS	HCl
MW15	D	71MW15DXDX01XA	W15DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW15DXDX01XL	W15DDL						X												
	S	71MW15SXSX01XA	W15SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW15SXSX01XL	W15SSL						X												
MW16	D	71MW16DXDX01XA	W16DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW16DXDX01XL	W16DDL						X												
	S	71MW16SXSX01XA	W16SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW16SXSX01XL	W16SSL						X												
MW17	D	71MW17DXDX01XA	W17DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW17DXDX01XL	W17DDL						X												
	S	71MW17SXSX01XA	W17SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW17SXSX01XL	W17SSL						X												
MW18	D	71MW18DXDX01XA	W18DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW18DXDX01XL	W18DDL						X												
	M	71MW18MXMX01XA	W18MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW18MXMX01XL	W18MML						X												
	S	71MW18SXSX01XA	W18SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW18SXSX01XL	W18SSL						X												

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MMR Groundwater Samples from Newly Installed Wells				Parameters:	Explosives(colorimetric)	Explosives (EPA 8330)	Inorganics:	Metals (unfiltered)	Metals (filtered)	Cyanide	Phos., NO2/NO3, NH4	Cl & SO4	Alkalinity (carbonate, bicarbonate, & hydroxy)	TOC	Other Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
				Cont:	250ml	2*1L		500mL	500mL	1L	1L	1L	100mL	2*40mL		3*40mL	2*1Lg	2*1Lg	2*1Lg	3*40mL	3*40mL
Loc.	Depth	MMR ID	EPA/ Ogden ID	Pres:		none		HNO3	HNO3	NaOH	H2SO4	none	none	H2SO4		HCl	none	none	none	thioS	HCl
MW19	D	71MW19DXDX01XA	W19DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW19DXDX01XL	W19DDL						X												
	S	71MW19SXSX01XA	W19SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW19SXSX01XL	W19SSL						X												
MW20	S	71MW20SXSX01XA	W20SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW20SXSX01XL	W20SSL						X												
MW21	D	71MW21DXDX01XA	W21DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW21DXDX01XL	W21DDL						X												
	S	71MW21SXSX01XA	W21SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW21SXSX01XL	W21SSL						X												
MW22	S	71MW22SXSX01XA	W22SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW22SXSX01XL	W22SSL						X												
MW23	D	71MW23DXDX01XA	W23DDA			X		X		X	X	X	X	X		X	X	X	X	X	X
	D	71MW23DXDX01XL	W23DDL						X												
	M	71MW23MXMX01XA	W23MMA			X		X		X	X	X	X	X		X	X	X	X	X	X
	M	71MW23MXMX01XL	W23MML						X												
	S	71MW23SXSX01XA	W23SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW23SXSX01XL	W23SSL						X												

X = to be collected and submitted to laboratory

MMR Groundwater Samples from Newly Installed Wells				Parameters:	Explosives(colorimetric)	Explosives (EPA 8330)	Inorganics:	Metals (unfiltered)	Metals (filtered)	Cyanide	Phos., NO2/NO3, NH4	Cl & SO4	Alkalinity (carbonate, bicarbonate, & hydroxy)	TOC	Other Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
				Cont:	250ml	2*1L		500mL	500mL	1L	1L	1L	100mL	2*40mL		3*40mL	2*1Lg	2*1Lg	2*1Lg	3*40mL	3*40mL
Loc.	Depth	MMR ID	EPA/ Ogden ID	Pres:		none		HNO3	HNO3	NaOH	H2SO4	none	none	H2SO4		HCl	none	none	none	thioS	HCl
MW24	S	71MW24SXSX01XA	W24SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW24SXSX01XL	W24SSL						X												
MW25	S	71MW25SXSX01XA	W25SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW25SXSX01XL	W25SSL						X												
MW26	S	71MW26SXSX01XA	W26SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW26SXSX01XL	W26SSL						X												
MW27	S	71MW27SXSX01XA	W27SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW27SXSX01XL	W27SSL						X												
MW28	S	71MW28SXSX01XA	W28SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW28SXSX01XL	W28SSL						X												
MW29	S	71MW29SXSX01XA	W29SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW29SXSX01XL	W29SSL						X												
MW30	S	71MW30SXSX01XA	W30SSA			X		X		X	X	X	X	X		X	X	X	X	X	X
	S	71MW30SXSX01XL	W30SSL						X												

X = to be collected and submitted to laboratory

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